

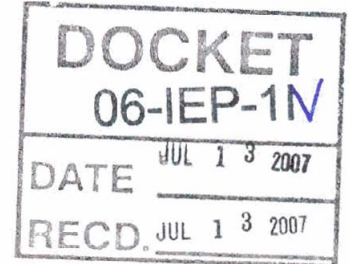


NUCLEAR ENERGY INSTITUTE

Marshall Cohen  
SENIOR DIRECTOR, LEGISLATIVE PROGRAMS

July 13, 2007

Chair Pfannenstiel and Distinguished Commissioners  
California Energy Commission  
1516 Ninth St., MS-4  
Sacramento, CA 95814-5512



**RE: Comments on Energy Report: Nuclear Power, 2007**  
**Docket No. 06-IEP-[1N]**

Dear Commissioners:

The Nuclear Energy Institute (NEI) would like to thank the Commission for the opportunity to comment on its *Nuclear Power In California: 2007 Status Report*. Enclosed you will find NEI's comments on a range of issues covered in the draft report. In addition, you will find our most recent *Status and Outlook for New Nuclear Power Plants In the United States-July 2007*, which we believe provides a brief and useful, forward looking assessment of nuclear power.

NEI commends the Commission for the thoroughness of its draft report and related workshop to review the status of nuclear power in the United States and the implications for California of nuclear power in 2007 and going forward. Although it contains a few inaccuracies and/or omissions which we will address in our comments, its main value is as a historical reference document. Like California's law limiting new nuclear power, many referenced documents are 30 years old and come from a time with different priorities, options and experiences.

We believe the outlook for nuclear energy has changed since 2005 when your Commission last reviewed nuclear power. The national debate on issues surrounding global warming and our energy needs for the coming decades has taken on substantially greater urgency for our country. As is usually the case, California is taking the lead on some of these issues, like global warming, with its new policies relating to greenhouse gas emissions.

The Commission's IEP process will play an important role as California considers how it will match its leadership on greenhouse gas emissions with a strategy to meet its energy needs. NEI believes nuclear energy must be a part of that strategy. Nuclear energy is and will continue to be the largest single component of non-greenhouse gas emitting energy produced in the United States and throughout the world.

As our comments demonstrate, nuclear energy is an extremely safe, clean, reliable and economical generation source. Used nuclear fuel is safely and securely managed today, providing time for the eventual implementation of the nation's used fuel repository program.

NEI is available to assist the Commission in any way it can, to provide additional information, to foster discussion and to help find answers to questions the Commission might have as it tackles a future energy strategy for the State that meets demand growth, economic aspirations and environmental goals.

Again, our thanks for this opportunity.

Sincerely,

Marshall Cohen  
Senior Director, Legislative Programs  
Nuclear Energy Institute

Attachments

**NEI Comments on *Nuclear Power In California: 2007 Status Report*  
Draft Consultant Report Prepared For the California Energy Commission**

NEI provided written comments to the Commission on June 28, 2007 (*RE: Comments on Energy Report: Nuclear Power, 2007 Workshops, Docket No. 06-IEP-[IN]*) and provided oral comments during the June 28 Workshop. These written and oral comments were in response to the extensive questions posed by the Commission and explored in the related workshops. As such, our comments represent our current thinking on these topics and should be considered in addition to the comments provided in this correspondence.

The following comments are provided in the order presented in the Executive Summary, body or appendices of the draft consultants' report.

**Nuclear Waste Issues:**

California's nuclear policy embodied in the 1976 nuclear statutes is now more than 30 years old. Dating from a time with different energy security and environmental constraints, it was also from a time with limited used fuel management options and repository experience.

Today there is international scientific consensus that a deep geologic repository concept with a design that combines natural and engineering barriers to isolate used nuclear fuel from the biosphere is the appropriate disposition path. Further, the desirable characteristics of a repository are well understood and suitable environments for repositories exist throughout the world, including locations in the United States.<sup>1</sup>

A similar consensus exists on these points among the 27 members of the Keystone Center's Nuclear Power Joint Fact-Finding project completed in June 2007<sup>2</sup>. This group consensus is significant in that the participants include environmental and nuclear industry professionals, public utility commissioners, consumer advocates and academics.

Progress is being made on repositories in Finland and Sweden and the WIPP facility, a deep geologic repository for long-lived transuranic radioactive waste is permitted and in operation in Carlsbad, NM. Thanks to state and tribal input, U.S. Department of Energy's shipments of radioactive waste to this facility are routine and uneventful.

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<sup>1</sup> Scientific and Technical Basis for the Geological Disposal of Radioactive Wastes. Technical Reports Series no. 413. IAEA 2003

<sup>2</sup> Keystone Center, Nuclear Power Joint Fact-Finding report, June 2007

The progress of implementing the U.S. used fuel repository at Yucca Mountain has been slower than any party could wish but that might be expected of this first-of-a-kind facility to be licensed in a public participatory process.

Fortunately, used older fuel can be safely and securely stored in fuel pools and dry storage systems. This is another consensus finding of the Keystone NJFF report. The NJFF report also found that centralized interim storage is a reasonable alternative for managing waste from decommissioned plants sites and could become cost effective for operating reactors in the future.

These dry storage systems were not in existence in 1976 when California passed its nuclear statutes. Today, dry storage systems are a mature technology that is widely deployed.

A California state or western regional interim storage facility, using proven dry storage technology, would permit removal of used fuel from California decommissioned and operating commercial nuclear power plants, and provide safe and secure storage for the used nuclear fuel until disposal and/or recycling facilities are available. This would reduce the cost to California ratepayers and allow decommissioned sites to be fully redeveloped.

#### **New Plants: Range of Potential Costs:**

The last sentence of this section on page 8 of the Executive Summary minimizes or ignores significant recent activities by a number of nuclear-supportive state legislatures and regulatory commissions alike in trying to provide cost-recovery assurance to spur nuclear power development.

Several states that value fuel diversity and wish to encourage the development of stably-priced, reliable electricity from nuclear energy have pursued policies to help balance the investment risk for new reactors. Florida, South Carolina and Louisiana have passed legislation and/or regulations that allow a utility that is issued a certificate of necessity for a new nuclear power plant to collect the carrying cost of construction work in progress (CWIP) during construction. These states have set up periodic, typically annual, reviews to determine prudence of costs incurred on a regular basis, ongoing basis during construction. This provides developers with clear signals on cost recovery during construction from their state commissions, especially if cost overruns occur or economic conditions change.

Others states, such as Iowa, Wisconsin, Georgia, Virginia and Texas have adopted policies that also can help to encourage new nuclear construction by providing some sort of financial incentives and/or cost recovery assurance.

### **Environmental and Societal Impacts of Nuclear Power:**

Nuclear Power and the Environment, grudgingly recognizes nuclear energy's low life-cycle CO<sub>2</sub> emissions – about equal to that of solar power – but ignores the other significant clean-air benefits of nuclear energy. The avoidance of criteria air pollutants such as nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), Mercury (Hg) and particulates.

### **Economic Growth and Emission-Free Electricity:**

California has experienced an average growth in Gross State Product of 3.0 percent per year over the past five years. According to the Energy Information Administration's Annual Energy Outlook for 2007, California's electricity demand is projected to grow by 2.2 percent yearly and by 74 percent between now and 2030. Projected CO<sub>2</sub> emissions are projected to grow by 3.5 percent yearly and to increase by 160 percent between now and 2030.

California already has taken steps to limit this increase in projected CO<sub>2</sub> emissions in Senate Bill 1368 through an emissions performance standard. Meeting this new standard will limit the use of coal, increase the pressure on natural gas and increase the value of nuclear energy.

To keep California's economy growing, the state will need new sources of power. At the same time, parts of California must deal with poor air quality. Emission-free sources, such as nuclear power plants, provide safe, reliable and affordable power to meet the state's economic growth without polluting the air.

### **Status of the State's Air Quality:**

Counties in non-attainment for EPA's new 8-hour ozone standard surround Los Angeles, San Francisco and San Diego and cover most of the San Joaquin Valley. Ozone contributes to smog, which can lead to asthma attacks and respiratory impairment in young children and the elderly. Diablo Canyon and San Onofre supply emission-free power to California and help to improve air quality.

### **Nuclear Energy Prevents Emissions:**

Generating electricity with nuclear energy prevents the emission of pollutants such as SO<sub>2</sub> and NO<sub>x</sub> and greenhouse gases such as CO<sub>2</sub> associated with the burning of fossil fuels. The nuclear power plants in California avoided the emission of 200 tons of SO<sub>2</sub>, 2,000 tons of NO<sub>x</sub> and 14.3 million metric tons of CO<sub>2</sub> in the year 2006 (Source: NEI/EPA). Emissions of SO<sub>2</sub> lead to the formation of acid rain. NO<sub>x</sub> is a key precursor of both ground-level ozone and smog. Greenhouse gases such as CO<sub>2</sub>, contribute to global warming. For perspective, the 2,000 tons of NO<sub>x</sub> avoided by the nuclear power plants in California is the amount of NO<sub>x</sub> released in a year by 107,000 passenger cars.

### **Potential Upgrades at Nuclear Plants:**

With additional capital investment, more emission-free power can be generated at most existing nuclear power plants. This process of increasing power output capacity is called an “upgrade.” According to an analysis performed for the U.S. Department of Energy, upgrades at Diablo Canyon and San Onofre could supply four percent more electricity and avoid annual emissions of 500 tons of SO<sub>2</sub>, 800 tons of NO<sub>x</sub> and 640,000 metric tons of CO<sub>2</sub>.

### **Nuclear Power in the Coming Years**

Please see attached *Status and Outlook for New Nuclear Power Plants In the United States-July 2007*, which we believe provides a brief and useful, forward looking assessment of nuclear power.

### **Environmental Impacts of Uranium Mining – Appendix D:**

This text is somewhat dated and does not acknowledge the current state of the industry and the regulatory oversights of the NRC and Agreement States in ensuring adequate protection of workers and the environment. It criticizes the mining activities in the 1940s & 1950s – which were totally unregulated and which did do damage to the environment and to tribal lands – but fails to acknowledge that nowadays mining is strictly regulated by the Nuclear Regulatory Commission, the U.S. Environmental Protection Agency and the States.

A majority of new uranium production will come from solution mines which have a very minimal environmental “footprint.” Most uranium mined in this fashion originates in very saline aquifers or in aquifers for which the pre-mining water quality is unsuitable for human or animal consumption (e.g. Texas). The practice of injecting waste waters into deep, non-potable aquifers – a common solution mining practice – is also closely regulated and, again, does not contaminate potable aquifers. The text fails to mention the obligation of the DOE to provide perpetual stewardship of stabilized mill tailings and old mine sites through imposition of institutional controls; groundwater quality around such stabilized tailings piles is regularly monitored by the DOE and, should any excursions of contamination be detected, the DOE can use the bonds set aside for permanent maintenance of the tailings for remedial ground water work (e.g. pumping & treating). Finally, the text does not mention that the EPA must grant an “exemption” to any portion of an aquifer that will be solution mined; this exemption forever excludes the mined area of the aquifer from use as a source of human drinking water, thereby protecting human health. All solid residues from a solution mine must be removed from the mine site and transported for permanent disposal in an NRC-licensed disposal facility. This, there is no opportunity for dispersal of radioactive wastes from such operations following their closure.

Further, it is not necessarily true that mining communities are poor. Overall, the observations on uranium mining in the text are dated and do not reflect how the industry now responsibly acts or how it is regulated.

July 2007

## Status and Outlook for New Nuclear Power Plants In the United States

The last several years have seen renewed interest in new nuclear power plant construction from the electric power industry and political leaders at the national, state and local levels. This renewed interest is the product of several converging factors:

- ▶ continued growth in electricity demand and tightening reserve margins are driving the need for new baseload generating capacity. According to government forecasts, the United States will need about 300,000 megawatts of new generating capacity by 2030.
- ▶ increasing fuel prices, which have led to large rate increases in the cost of electricity in some states. This has reinforced the need for a diversified portfolio of generation sources.
- ▶ growing concerns about the risks associated with other major sources of electricity, notably clean air issues and climate change (coal-fired generation) and price volatility (gas-fired generation).
- ▶ implementation of federal and state policies that help stimulate the construction of new nuclear power plants, or provide assurance of investment recovery.

Seventeen companies or groups of companies are developing applications for COLs and intend to file those applications with the Nuclear Regulatory Commission (NRC) beginning this year. Those applications encompass as many as 31 new nuclear reactors.

The process of licensing and building the first new nuclear power plants is expected to take approximately 9-10 years: Approximately two years to prepare an application to the NRC for a construction/operating license (COL); 36-42 months for NRC review and approval of the COL, and 4-5 years for construction. Later plants should benefit from faster NRC review times and shorter construction periods.

Construction of new nuclear power plants is expected to begin by the end of the decade. These first plants will start commercial operation in 2015-2016.

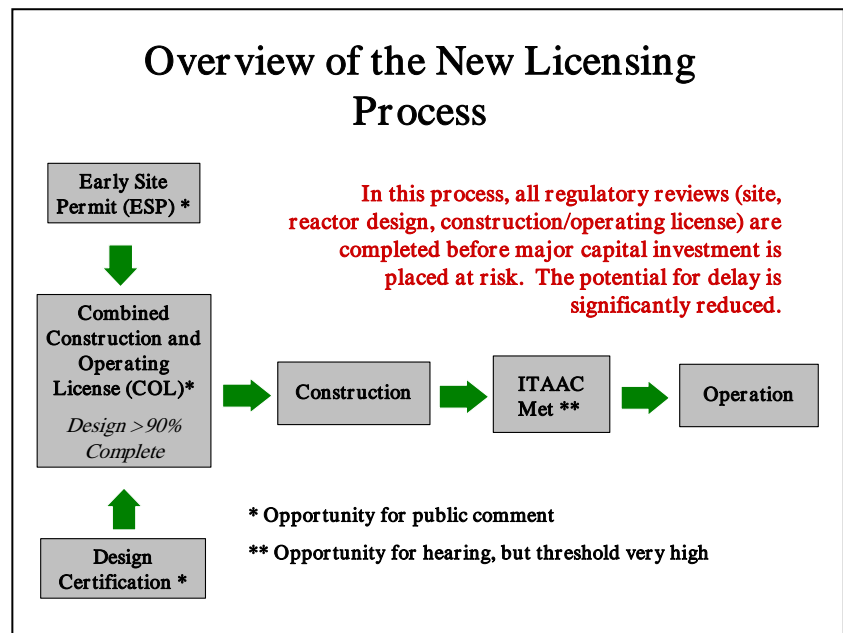
## **The New Licensing Process**

The next generation of nuclear plants will benefit from an improved licensing process, which was completely overhauled by the Energy Policy Act of 1992. The new process allows the NRC to: 1) pre-approve a prospective site for a new nuclear plant, 2) certify<sup>1</sup> a new reactor design, and 3) issue a single license to build and operate a new nuclear plant. The new licensing process moves all regulatory and licensing approvals to the front end of the process, before significant capital expenditures are made, thereby reducing licensing risk significantly.

This is a major change from the old licensing process, under which all of today's nuclear plants were licensed. The old

process required two licenses—one to build the plant, and another to operate it. In many instances, companies received a construction permit and started construction with only a conceptual design. The old process—"design-construct-inspect as you go"—invariably resulted in significant rework and redesign. In addition, the regulatory process was maturing and the number and extent of regulations were expanding. This resulted in significant redesign and field modifications.

Once the plant was built, it had to obtain an operating license. In some cases, a multi-billion-dollar facility stood idle while the licensing proceeding progressed. In some cases, what should have cost \$500 million and taken six years to build cost several billion dollars and took 10-plus years to complete.



<sup>1</sup> Design certification is an extensive rulemaking process under which the Nuclear Regulatory Commission reviews a design and “certifies” that it meets all necessary safety standards.



The new licensing process requires designs to be complete before a license is granted. That license will also allow the plant to begin operating immediately when construction and testing are complete provided there is evidence that the plant has been constructed to design specifications.

The new licensing process includes a system by which the NRC and the project sponsor can verify that the plant has been built in accordance with the design, as determined by the acceptance criteria referenced in the license and known as ITAAC, or Inspections, Tests, Analyses and Acceptance Criteria.

A key risk-management tool, the ITAAC are quantitative criteria that are spelled out in the construction and operating license (COL). When the ITAAC are met, the NRC and the public know that the plant has been built according to its design and hence will operate safely. If the ITAAC are met, there are no grounds for hearings, and no basis for intervention and delay.

### ***Technology Readiness***

The new nuclear power projects now being developed employ advanced versions of the light water reactor technology used in the 104 operating plants, optimized for improved safety and reliability and lower operating and maintenance costs (see page 8). Unlike the advanced coal-based systems, which are growing more complex as plant designers grapple with more stringent environmental requirements, the advanced nuclear plants are moving in the direction of greater simplicity, as plant designers take advantage of 30 years of operating experience to improve safety performance while reducing the number and complexity of engineered safety systems.

Because these new nuclear plant designs are evolutionary improvements on today's plants, and because several of these designs have already been deployed overseas, technology and operational risk is low. These designs are expected to achieve the O&M performance achieved by the top quartile of today's operating plants (i.e., below \$10 per megawatt-hour). Although precise estimates of capital cost must await the completion of detailed design and engineering work now underway, the advanced nuclear power plants are expected to be competitive with advanced coal-based generating capacity, particularly if carbon capture and sequestration is required.

### ***Financing New Nuclear Generating Capacity***

Consensus estimates suggest that the electric power industry, over the next 15 years, must invest between \$750 billion and \$1 trillion in new generating capacity, new transmission and distribution infrastructure and

environmental controls. This new capital spending represents a major challenge to the electric power industry.

The Energy Policy Act of 2005 recognized this financing challenge and provided limited investment stimulus for construction of new baseload power plants. In the case of nuclear power, that stimulus included:

- ▶ a production tax credit of \$18 per megawatt-hour for 6,000 megawatts of new nuclear capacity.
- ▶ a form of insurance (called standby support) under which the federal government will cover debt service for the first few plants if commercial operation is delayed. This coverage is capped at \$500 million for the first two reactors, and \$250 million for the next four reactors. The delays covered include NRC failure to meet schedules and litigation.
- ▶ federal loan guarantees for up to 80 percent of total project cost.

Of the three major incentives for new nuclear power plant development provided by the Energy Policy Act, the loan guarantee program is the most effective in addressing the major challenge facing new nuclear power plant construction, which is construction financing.

The production tax credit somewhat improves the financial attractiveness of a project after it is in commercial operation, but the construction period is when a new nuclear project most needs credit support and the production tax credit provides no help at that time. The standby support or delay insurance against licensing or litigation delays has a number of shortcomings, including the fact that it is limited to debt service, and provides no coverage for the other substantial delay costs that would be incurred by a nuclear project subject to licensing or litigation delays.

That leaves the energy loan guarantee program as a critical factor in corporate decisions to proceed with new nuclear projects, and in facilitating construction financing and access to capital.

A properly structured loan guarantee program would enable companies to employ project financing on a non-recourse basis. The ability to use non-recourse project finance structures offsets one of the most significant financing challenges facing new nuclear power plant construction – the cost of these projects relative to the size, market value and financing capability of companies that will build them. A new nuclear plant is a \$4-6 billion project (including interest during construction). Although \$4-6 billion projects are not unique in the energy business, such projects are typically

built by consortia of major oil companies with market values many times larger than the largest electric companies.

Project financing, supported by loan guarantees, also allows a more efficient, leveraged capital structure, which reduces the weighted average cost of capital and thus provides a substantial consumer benefit in the form of lower electricity prices. Loan guarantees also mitigate the impact on the balance sheet of these large capital projects which would otherwise place stress on credit quality and bond ratings.

Loan guarantees are important to new nuclear plant financing for both unregulated and regulated companies.

Unregulated generating companies will be hard-pressed to build nuclear power plants and other large capital-intensive baseload projects except on a project finance basis with the debt financing secured by the federal government. Unregulated companies do not have the capacity to finance these projects on balance sheet without access to project finance structures. Many regulated electric companies, especially those pursuing multiple generating and transmission projects at the same time, may also be limited in their ability to finance projects without project finance capability because of substantial pressure on credit quality and debt ratings.

### ***Timing and Pace of New Nuclear Power Plant Development***

Currently, 17 companies or groups of companies are preparing 21 COL applications for as many as 31 new nuclear reactors (see page 7). The first COL applications will be filed with the NRC in 2007 and 2008: 4-7 COL applications will be filed in 2007 (covering up to 10 reactors), and 10-12 (covering up to 21 reactors) in 2008. Those companies should receive their COL approvals in 2011, at which time they can start safety-related construction. (Some companies are expected to start site preparation as early as 2008, and could start safety-related construction before receiving their COLs under a Limited Work Authorization from the NRC.) The first of these new reactors will be ready for commercial operation in 2015-2016.

As they prepare their COL applications, companies have started long-lead procurement of large forgings and major components like reactor pressure vessels and steam turbine generators.

Construction of the first units is expected to take 48-60 months from first safety-related concrete to commercial operation, declining to the 42-month

range as companies gain construction experience. These construction durations are achieved overseas.

Estimates of how much new nuclear generating capacity will be built are obviously subject to many variables and assumptions. Assuming continued policy support from the federal and state governments, however, up to 45 new nuclear power plants could be in commercial operation by 2030 (approximately 60,000 megawatts of capacity, assuming an average plant size of 1,350 megawatts).

To put this estimate into perspective, NEI estimates that the United States would need approximately 51,000 megawatts of new nuclear capacity by 2030 to maintain nuclear energy at 20 percent of U.S. electricity supply (based on the forecast of 2030 electricity demand in the Energy Information Administration's *2007 Annual Energy Outlook*).

### ***The Value of Nuclear Energy in a Carbon-Constrained World***

The average nuclear plant avoids 6-7 million metric tons of carbon dioxide (CO<sub>2</sub>) each year. In 2006, America's 103 operating nuclear power plants avoided the emission of approximately 681 million metric tons of CO<sub>2</sub>, compared to the fuels that would have been burned in the absence of nuclear power. For perspective: The 681 million metric tons prevented by nuclear energy in 2006 is equal to the annual emissions from 96 percent of the country's passenger cars. In the absence of nuclear power, U.S. electric sector carbon emissions would be approximately 30 percent higher.

Nuclear energy's strategic value is clear from past performance. America's nuclear energy companies have achieved significant voluntary reductions in carbon emissions since 1994 as part of the U.S. Department of Energy's Climate Challenge and Climate Vision programs. Increased production from U.S. nuclear plants is responsible for the largest share of emissions reductions reported through these voluntary programs—36 percent of reductions from all sectors of the economy and 54 percent of the reductions reported from the electric sector alone in 2005.

**New Nuclear Plants Under Consideration<sup>1</sup>**

<i>Company</i>	<i>Site</i>	<i>Design</i>	<i>Number of Reactors</i>	<i>Date for Filing COL<sup>2</sup> Application</i>
Alternate Energy Holdings	Bruneau, ID	TBD	TBD	TBD
Amarillo Power	Amarillo, TX vicinity	EPR	1	FY <sup>3</sup> 2008
Ameren UE	Callaway, MO	EPR	1	FY 2008
Detroit Edison	Fermi, MI	TBD	TBD	FY 2009
Dominion <sup>4</sup>	North Anna, VA	ESBWR	1	FY 2008
Duke Energy	<i>William States Lee</i> Cherokee County, SC	AP1000	2	FY 2008
Entergy	River Bend, LA	ESBWR	1	FY 2008
Entergy (NuStart Energy <sup>5</sup> )	Grand Gulf, MS	ESBWR	1	FY 2008
Exelon	Clinton, IL	TBD	TBD	TBD
Exelon	Texas	TBD	1	FY 2009
Florida Power & Light	TBD	TBD	TBD	FY 2009
NRG Energy/STPNOC	Bay City, TX	ABWR	2	FY 2008
PPL	Susquehanna, Pa	TBD	1	TBD
Progress Energy	Harris, NC;	AP1000	2	FY 2008
Progress Energy	Levy Co., FL	AP1000	2	FY 2008
South Carolina Electric & Gas	Summer, SC	AP1000	2	FY 2008
Southern Company	Vogtle, GA	AP1000	2	FY 2008
TVA (NuStart Energy <sup>5</sup> )	Bellefonte, AL	AP1000	2	FY 2008
TXU	Comanche Peak, TX	APWR	2	FY 2008
UniStar Nuclear <sup>6</sup>	Calvert Cliffs, MD plus 2 additional sites	EPR	3	First Submittal - FY 2008

<sup>1</sup> This compendium is based on public announcements as of July 2007.

<sup>2</sup> Construction/Operating License

<sup>3</sup> Fiscal Year

<sup>4</sup> This consortium includes Dominion, General Electric, Bechtel.

<sup>5</sup> NuStart Energy includes Constellation, Duke, EDF International North America, Entergy, Exelon, FPL Group, General Electric, Progress, SCANA, Southern, Tennessee Valley Authority, Westinghouse.

<sup>6</sup> UniStar Nuclear is a joint venture of Constellation Energy and Areva.

**Status Of Advanced Nuclear Power Plant Designs**

<b><i>Design</i></b>	<b><i>Supplier</i></b>	<b><i>Background and Current Status</i></b>
Advanced Boiling Water Reactor	General Electric	This large (1,350 MW) boiling water reactor is an evolutionary improvement on the boiling water reactors that make up approximately one-third of the U.S. nuclear power plant fleet. The first models of this design were deployed commercially by Tokyo Electric Power Co. at its Kashiwazaki-Kariwa generating station in Japan. TEPCO and other Japanese utilities continue to build ABWRs. This design was certified by the NRC in 1997.
AP1000	Westinghouse	The AP1000 is a 1,150-MW reactor, the first approved by the NRC to employ so-called “passive” safety features. The passive designs substitute natural forces like gravity to deliver cooling water to the reactor. The improved design eliminates a number of the pumps, valves, piping and other components that increase the complexity and the capital cost of today’s nuclear plants. The AP1000 received its final design approval from the NRC in late 2004, and the final certification rule became effective in January 2006.
ESBWR	General Electric	The ESBWR is GE’s new 1,500-MW design incorporating “passive” safety features. By simplifying the design of the ESBWR compared to the ABWR, GE expects to reduce the capital cost of the plant by approximately 20 percent. GE filed its application for design certification with the NRC in August 2005. The application has been accepted and the Final Design Approval (FDA) is scheduled for late 2008, with certification to follow in 2009.
EPR	Areva (in the U.S. market: UniStar, a joint venture of Areva and Constellation)	The EPR is a large (1,600 MW) design developed by Areva, the reactor supplier formed by Framatome (France) and Siemens (Germany). Areva has formed a joint venture with Constellation Energy Group called UniStar Nuclear to deploy the EPR technology in the United States. The first EPR is now being built in Finland, and it will be the next generation of nuclear plants built in France by Electricité de France. The EPR is an advanced light water reactor. The EPR design includes additional safety features not in today’s light water reactors, including four safety trains instead of two, bunkered safety systems, double containments, and additional severe accident management features. Areva plans to make a design certification submittal to the NRC for the EPR in 2007.
US-APWR	Mitsubishi	The Mitsubishi US-APWR (1,700 MW) is the largest PWR design available. The US-APWR is an evolutionary design incorporating features of the existing Mitsubishi fleet of 23 Japanese PWRs. The combination of a 20% reduction in plant building volume, advanced construction techniques, and large modules is expected to reduce the construction cost. The application for a US-APWR design certification is underway and is planned for submittal to the NRC in late 2007.